

UNIVERSIDADE FEDERAL DE SANTA MARIA
CENTRO DE CIÊNCIAS DA SAÚDE
PROGRAMA DE PÓS GRADUAÇÃO EM CIÊNCIAS ODONTOLÓGICAS

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**ASSOCIAÇÃO ENTRE SUCÇÃO NUTRITIVA E NÃO NUTRITIVA E
MALOCLUSÃO NA DENTIÇÃO MISTA**

Santa Maria
2021

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Dissertação apresentada ao Programa de Pós-Graduação em Ciências Odontológicas da Universidade Federal de Santa Maria (UFSM, RS), como requisito parcial para obtenção do título de **Mestre em Ciências Odontológicas com Ênfase em Ortodontia**.

Orientadora: Prof.^a Dr.^a Mariana Marquezan

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Aprovado em 26 de fevereiro de 2021.

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Santa Maria, RS
2021

DEDICATÓRIA

Aos meus filhos Benício e Conrado, a minha companheira Jaqueline, aos meus pais e a minha família, que sempre foram e são a base e inspiração na busca dos meus objetivos.

AGRADECIMENTOS

A concretização deste trabalho ocorreu, principalmente, pelo auxílio, compreensão e dedicação de várias pessoas. Agradeço a todos que, de alguma forma, contribuíram para a conclusão deste estudo e, de uma maneira especial, agradeço:

A Deus, que sempre permitiu que acontecessem coisas boas em minha vida.

À minha companheira Jaqueline Felin, pela paciência e por me fazer perseverar em momentos difíceis.

À minha orientadora Prof.^a Dr.^a Mariana Marquezan pela oportunidade concedida, pela divisão do seu conhecimento, paciência e toda dedicação.

À Prof.^a Dr.^a Ana Maria Toniolo da Silva, Professora aposentada do Curso de Fonoaudiologia da UFSM e coordenadora geral do projeto guarda-chuvas que deu origem a esse trabalho.

À toda equipe da ortodontia da UFSM, que dividiram muito conhecimento e receberam-me com carinho.

À Luana Berwig, Débora Assaf, Kaline Antunes, Daniani Noedel e Paula Guerino, que fizeram as coletas de dados que viabilizaram o estudo.

À Jessica Knorst e Lara Furlan por toda ajuda e dedicação.

À Universidade Federal de Santa Maria, pela oportunidade de desenvolver e concretizar este estudo.

Aos professores e servidores técnico administrativos em educação do Programa de Pós-Graduação em Ciências Odontológicas da Universidade Federal de Santa Maria, pelas contribuições.

À Capes, pela bolsa de estudos concedida.

Enfim, a todos aqueles que fazem parte da minha vida e que são essenciais para eu ser, a cada dia, um ser humano melhor.

RESUMO

ASSOCIAÇÃO ENTRE SUCCÃO NUTRITIVA E NÃO NUTRITIVA E MALOCLUSÃO NA DENTIÇÃO MISTA

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Objetivo: O objetivo do estudo foi avaliar a associação entre maloclusões na dentição mista, amamentação e hábitos de sucção não nutritiva progressos em escolares. **Métodos:** Foram avaliados 547 escolares em fase de dentição mista, com idade entre 7 e 13 anos, através de questionários e exame clínico. Modelos de regressão de Logística Binomial e Multinomial foram utilizados para avaliar a associação entre aleitamento materno e hábitos de sucção digital e de chupeta de acordo com os desfechos mordida cruzada posterior, alterações de sobressaliência e de sobremordida. **Resultados:** Indivíduos que tinham o hábito de sucção não nutritiva tiveram 2,16 vezes mais chance de apresentar mordida aberta anterior (MAA) (OR 2,16; 95% IC 1,07-4,33) e 2,39 vezes maior chance de apresentar mordida cruzada posterior (MCP) (OR 2,39; 95% IC 1,56-5,49). Crianças amamentadas exclusivamente até os seis meses de idade apresentaram maior frequência de normalidade para sobressaliência e sobremordida e os menores índices de MCP. Entretanto, na análise ajustada, o aleitamento materno não apresentou associação com as maloclusões estudadas na fase da dentição mista. **Conclusão:** O aleitamento materno não apresentou associação com o desenvolvimento de maloclusões enquanto os hábitos progressos de sucção não nutritivos demonstraram-se associados ao desenvolvimento de maloclusões na dentição mista.

Palavras Chaves: Dentição mista. maloclusão. Aleitamento materno. Hábitos.

ABSTRACT

ASSOCIATION BETWEEN MALOCCLUSIONS, NUTRITIVE AND NON-NUTRITIVE SUCKING HABITS IN SCHOOL-AGE CHILDREN IN THE MIXED DENTITION STAGE

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Aim: The aim of this study was to evaluate the association between malocclusions in the mixed dentition stage, breastfeeding and past non-nutritive sucking habits in school-age children. **Methods:** In total 547 school children in the mixed dentition stage, in the age-range between 7 and 13 years, were evaluated, by means of questionnaires and clinical examinations. Binomial and Multinomial Logistic Regression Models were used to evaluate the association between breastfeeding, finger and pacifier sucking habits, according to the outcomes posterior cross bite, changes in overjet and overbite. **Results:** Individuals who had non-nutritive sucking habits had 2.16 times more chance of having anterior open bite (AOB) (OR 2,16; CI 95%, 1.07-4.33). Individuals who had non-nutritive sucking habits had 2.39 times more chance of having posterior cross bite (PCB) (OR 2.39; CI 95%, 1.56-5.49). Children who were exclusively breastfed up to six months of age had higher frequency of normality for overjet and overbite, and the lowest PCB indexes. However, in adjusted analysis, breastfeeding showed no association with the malocclusions studied, in the mixed dentition stage. **Conclusion:** Breastfeeding was not associated with the development of malocclusions, while past non-nutritive sucking habits were associated with the occurrence of malocclusion in mixed dentition.

Keywords: Mixed dentition. Malocclusion. Breastfeeding. Habits.

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LISTA DE ABREVIATURAS E SIGLAS

DP	Desvio padrão
OR	Odds ratio
MAA	Mordida aberta anterior
MCA	Mordida cruzada anterior
MCP	Mordida cruzada posterior
OHRQoL	Oral health-related quality of life
ACB	Anterior crossbite
AOB	Anterior open bite
PCB	Posterior crossbite

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1 INTRODUÇÃO

A Organização Mundial da Saúde indica o aleitamento materno exclusivo até o sexto mês de vida dos bebês, salientando os benefícios nutricionais e imunológicos que são oferecidos (World Health Organization, 2017). Além destes benefícios, a sucção no seio materno propicia o correto posicionamento das estruturas orofaciais implicando em uma importante matriz de estímulos neuromusculares para o correto crescimento e desenvolvimento as estruturas do sistema estomatognático (Thomaz, Cangussu, Assis, 2012).

O leite materno é o melhor alimento para os bebês, pois contém altos níveis de vitaminas e minerais, enzimas, leucócitos e imunoglobulinas que suplementam o sistema imunológico, protegendo de alergias, doenças respiratórias, infecções bacterianas e virais, e distúrbios de digestão. A longo prazo, bebês amamentados com leite materno, têm menor chance de serem obesos ou com sobrepeso, de desenvolver diabetes tipo 2 e apresentam melhor desempenho em testes de inteligência (Larsson, 2001; Charchut et al., 2003; Peres et al., 2007, Suzely et al., 2008).

O aleitamento pode acontecer não só pelo seio materno mas também em copo ou mamadeira. Constitui-se em o hábito deletério a substituição do aleitamento pela sucção digital ou da chupeta (Lopes et al., 2015; Abreu et al., 2016; Faria et al., 2018). As evidências disponíveis não inferem o aleitamento artificial como fator causal no desenvolvimento de alterações do sistema estomatognático, porém, ele pode suprimir a amamentação materna. A amamentação materna constitui um fator de proteção para o desenvolvimento da sucção não-nutritiva (Suzely et al., 2008), sabidamente envolvida na etiologia de maloclusões (Chen et al., 2015; Ogaard et al., 1994; Yonezu et al., 2013, Sun, et al., 2015). A introdução de hábitos orais não nutritivos é considerada fator de risco para o desenvolvimento de maloclusões (Bishara et al., 2006; Scavone et al., 2007) tais como: mordida cruzada posterior (Scavone et al., 2007; Macena et al., 2009; Hebling et al., 2008) e mordida aberta anterior (Hebling et al., 2008), que são as mais prevalentes em crianças (Faria et al., 2013). Dessa maneira, acredita-se que a amamentação possa ser um fator de proteção ao desenvolvimento de maloclusões (Warren et al., 2002, Narbutyte et al., 2013).

Mordida cruzada posterior entende-se como a inversão da oclusão onde os dentes póstero inferiores ocluem por vestibular em relação aos dentes póstero superiores. A prevalência dessa maloclusão apresenta ampla variação no Brasil, sendo descrita em 11,6% a 54% das crianças (Peres et al., 2007). Esta variação pode ser explicada pela diversidade racial e miscigenação da população brasileira e também por variações metodológicas nos estudos.

Sobressaliência é a distância no sentido horizontal entre a vestibular dos incisivos inferiores e a face palatina dos incisivos superiores, e ainda, sobremordida entende-se como a distância entre as incisais dos incisivos superiores e os incisivos inferiores em sentido vertical (Moyers, 1990). Variações entre 0,5 mm e 3,5 mm são consideradas normais na dentição mista (Proffit et al, 2012). Sobremordida igual a zero ou com valores negativos é considerada como mordida aberta anterior. Sobremordida maior que 3,5 mm é considerada sobremordida profunda. Sobressaliência igual a zero ou com valores negativos é considerada como mordida cruzada anterior. Já a sobressaliência maior que 3,5mm é considerada como sobressaliência acentuada. De acordo com os dados do SB Brasil 2010, no sul do Brasil, a prevalência de sobremordida profunda foi de 9,9% e da sobressaliência aumentada foi de 33,1% (SB BRASIL, 2010).

A sucção do seio materno exige muito da musculatura perioral. O exercício repetido promove o correto desenvolvimento da musculatura, aumenta o tônus e garante o posicionamento correto da língua favorecendo que as funções orais corretas sejam estabelecidas (Thomaz E, Cangussu M; Assis AM., 2012, Joanna Briggs Institute, 2006). A falta do aleitamento materno resulta na criança fazendo menos exercícios orais, levando ao subdesenvolvimento da musculatura, postura incorreta de lábios e língua e favorecendo a aquisição de maus hábitos orais, a introdução de hábitos deletérios favorecendo o surgimento de maloclusões (Thomaz E, Cangussu M; Assis AM., 2012, Joanna Briggs Institute, 2006, Karjalainen et al., 1999).

A presença de hábitos deletérios favorece o desenvolvimento inadequado das estruturas periorais podendo acarretar também em alterações funcionais, como o estabelecimento do modo respiratório oral ou oronasal (Peres et al., 2007, Peres et al., 2015). O posicionamento incorreto das estruturas orais ou as alterações funcionais podem acarretar em distúrbios do sono como sono agitado e ronco (Peres et al., 2007, Karjalainen et al., 1999).

A literatura não fornece um critério único para definir o surgimento de uma maloclusão, mas uma vez estando em processo ou estabelecida, deve-se atentar para sua interceptação e correção (Chen et al., 2015, Peres et al., 2017). Identificar a etiologia e o diagnóstico precoce das más oclusões se faz de fundamental importância para uma correta assistência profissional, aconselhando a interrupção dos hábitos de sucção, associada ou não ao tratamento ortodôntico interceptativo (Kobayashi et al., 2007, Romero et al., 2011). Embora a remoção precoce dos hábitos deletérios propicie a autocorreção de algumas más oclusões, comumente é necessária alguma intervenção não apenas para evitar alterações dento-esqueléticas, e também para

eliminar fatores perpetuantes que possam modificar o padrão de deglutição e a fala (Faria et al., 2013, Bauman et al., 2018, Joanna Briggs Institute, 2006).

Já sabido que o aleitamento materno é fator de proteção para o desenvolvimento de más oclusões na dentição decídua (Kobayashi et al., 2007, Peres et al., 2015) e que há associação entre hábitos deletérios e o desenvolvimento de más oclusões (Karjalainen et al., 1999, Kobayashi et al., 2007, Romero et al., 2011, Bueno et al., 2013, Faria et al., 2013, Sousa et al., 2014, Chen et al., 2015, Peres et al., 2015, Hermont et al., 2015, Faria et al., 2018, Costa et al., 2018). Entretanto, há carência na literatura de estudos que avaliem tais relações na dentição mista.

Os levantamentos epidemiológicos são importantes para o conhecimento da prevalência e tipologia das doenças bucais, conhecendo a situação de saúde da população e os fatores que influenciam, podendo basear ações e avaliar o impacto das propostas para alterar a situação encontrada. Dada a carência de levantamentos epidemiológicos em escolares para avaliação das maloclusões nesta fase da dentição, esse trabalho propôs-se avaliar se existe associação entre maloclusões na dentição mista, a amamentação e hábitos de sucção não nutritivos pregressos em escolares de 7 a 13 anos da cidade de Santa Maria, Rio Grande do Sul.

2 OBJETIVOS

2.1 Objetivo geral

Avaliar se existe associação entre maloclusões na dentição mista, a amamentação e hábitos de sucção não nutritiva pregressos em escolares com idade entre 7 e 13 anos, da cidade de Santa Maria, Rio Grande do Sul, no ano de 2015.

2.2 Objetivos específicos

Avaliar a associação entre as maloclusões de mordida cruzada posterior, alterações de sobressaliência (aumentada ou diminuída/mordida cruzada anterior) e alterações de sobremordida (profunda ou diminuída/mordida aberta anterior) com:

- a) hábitos de sucção:
 - Nutritivos (aleitamento materno e uso de mamadeira), e
 - Não nutritivos (sucção digital e uso de chupeta).
- b) variáveis fisiológicas:

- modo respiratório,
- qualidade do sono, e
- ronco.

c) e ainda com as variáveis demográficas e socioeconômicas:

- sexo,
- idade,
- raça, e
- escolaridade materna.

3 ARTIGO

Será submetido ao periódico *American Journal of Orthodontics and Dentofacial Orthopedics*.

Association between malocclusions in the mixed dentition stage, breastfeeding and past non-nutritive sucking habits in school-age children

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ABSTRACT

Introduction: The aim of this study was to evaluate the association between malocclusions in the mixed dentition stage, breastfeeding and past non-nutritive sucking habits in school-age children.

Methods: In total 547 school children in the mixed dentition stage, in the age-range between 7 and 13 years, were evaluated, by means of questionnaires and clinical examinations. Binomial and Multinomial Logistic Regression Models were used to evaluate the association between breastfeeding, finger and pacifier sucking habits, according to the outcomes posterior cross bite, changes in overjet and overbite.

Results: Individuals who had non-nutritive sucking habits had 2.16 times more chance of having anterior open bite (AOB) (OR 2,16; CI 95%, 1.07-4.33). Individuals who had non-nutritive sucking habits had 2.39 times more chance of having posterior cross bite (PCB) (OR 2.39; CI 95%, 1.56-5.49). Children who were exclusively breastfed up to six months of age had higher frequency of normality for overjet and overbite, and the lowest PCB indexes. However, in adjusted analysis, breastfeeding showed no association with the malocclusions studied, in the mixed dentition stage.

Conclusions: Breastfeeding was not associated with the development of malocclusions, while past non-nutritive sucking habits were associated with the occurrence of malocclusion in mixed dentition.

Introduction

In Brazil, the prevalence of malocclusion in deciduous and permanent dentition in 5- and 12-year-old children was evaluated in a nationwide epidemiological survey called SB Brasil in 2010, which aimed to use epidemiology to support planning and propose continuous practices for assessing and monitoring damage, risks and determinants of the health-disease process¹. According to these data, 22.9% of 5-year-old, and 40% of 12 years-old children had malocclusion. A systematic review² revealed that the overall need for malocclusion treatment in adolescents was 39%, a situation similar to that of Brazil. It is known that malocclusions, especially severe malocclusions in the esthetic zone, impact oral health-related quality of life in children and adolescents³, because it affects their social wellbeing^{3,4}, due to impaired functions such as eating, sleeping⁴ and speech⁵.

Right from the time they are born, babies receive neuromuscular stimuli that induce development of the stomatognathic system, which may favor or harm the correct arrangement of the orofacial structures. These stimuli may arise from nutritive sucking, either during

breastfeeding, or be artificially induced with the feeding bottle; or by non-nutritive sucking, such as finger or pacifier sucking habits. In this context, even if the child is exclusively breastfed for a period of up to at least one year of age, and the fact that this constitutes a protective factor against the development of malocclusions in primary dentition⁶, the introduction of deleterious habits acts as a modulator of growth and development of the structures⁷. Non-nutritive sucking habits are known to be associated with the development of malocclusion in primary dentition⁸⁻¹⁰ and that the short time of breastfeeding is a risk factor for the early introduction of oral non-nutritive sucking habits⁶. Pacifier sucking and time of exposure to this stimulus appear to be some of the most harmful among the other deleterious habits^{6,9}. In this context, nutritive and non-nutritive sucking habits affect not only the anatomy of the stomatognathic system, but their functions as well. Breastfeeding promotes stimuli to the structures responsible for mastication and swallowing^{6,11} as well as for nasal breathing¹². During breastfeeding, the tongue assumes an elevated position in the direction of the incisive papilla to enable sucking with more intense and forceful movements. In addition, lip sealing around the nipple and areola favors the nasal breathing mode¹¹. Whereas the deleterious habits favor inadequate positioning of the structures, such as a low position of the tongue in the floor of the mouth¹³, which results in deficient transverse maxillary growth, favoring a deficit in respiratory functions. Moreover, inadequate development of the structures, and reduction in respiratory conditions favor the development of respiratory sleep disorders¹⁴, and malocclusions.

In pre-school-aged children, accentuated overjet and anterior open bite appear as the malocclusions most associated, when pacifier use is considered¹⁵. Furthermore, there is a high prevalence of posterior cross bite when associated with non-nutritive sucking habits started at an early stage and persisting for a long period of time^{9,16}. In addition to being highly prevalent, malocclusions also cause impact on social well-being and oral health-related quality of life of the individuals, because occlusal imbalance and non-esthetic aspects due to malocclusion have been reported to be factors associated with significant episodes of bullying among children, in addition to a worse oral health-related quality of life (OHRQoL)^{17,18}.

The influence of breastfeeding and non-nutritive sucking habits on the development of occlusion and of the stomatognathic system in primary dentition have been extensively investigated and positive associations have been found^{6-11,13,19-22}. However, their influence on the continuity of craniofacial growth is still being questioned, since only few previous studies have evaluated these factors throughout the stage of mixed dentition^{23,24}.

The aim of this study was to evaluate whether there is association between malocclusions and nutritive and non-nutritive sucking habits in school-age children in the

mixed dentition stage. The conceptual hypothesis was that breastfeeding and non-nutritional sucking habits were associated with the development of malocclusions.

Material and Methods

Study Design and Sample

The research was conducted by means of an epidemiological survey with a cross-sectional approach, in the city of Santa Maria, Rio Grande do Sul, Brazil, in 2015. Prior to data collection, the research was approved by the Research Ethics Committee of the Federal University of Santa Maria under Protocol Number 08105512.0000.5346. The parents or legal guardians of the participants signed a Term of Free and Informed Consent, and the schools were provided with information about the objectives and procedures, and agreed to participate, by means of signing the Term of Institutional Authorization;

In the year of data collection, the Municipality had an estimated population of 261.031 inhabitants, of whom 30.216 (11.57%) were enrolled in primary schools, and 10.569 (34.97%), enrolled in 26 primary schools in the state network. Nine schools in the state network were selected, according to the different administrative regions, and weight of the school. Based on the list of pupils enrolled, the children between 7 and 13 years of age were invited to participate in the study, totaling 1550 children. Sampling was performed randomly by using a two-stage cluster sampling method, with schools being considered the primary sampling unit and the children, the secondary sampling unit.

The initial sample of the study was composed of 1550 children invited to participate in the study. Among these, 948 children had the consent of their legal guardians to participate (response rate of 61.2%). Of these, the following were excluded: those who did not have a permanent first molar (n=42); those who were in the stage of primary (n=2) or permanent (n=73) dentition, those who had premature loss of teeth (n=2); those with history of orthodontic (n=43) or speech language (n=22) treatment, and those who had cognitive limitations (n=3). The other children were excluded because they did not appear at the school on the days when the evaluations were performed (n=165), for reasons of being transferred to another school during the period of the research (n=43), or due to refusing to undergo the clinical exams (n=6). The final sample considered for this study, therefore, consisted of 547 children in the stage of mixed dentition, in the age-range between 7 and 13 years.

For calculating the sample size, a standard error of 5% was considered, confidence level of 95%, and prevalence of malocclusion of 27.5% in the group exposed (breastfeeding for less than 12 months) and 8.6% in the non-exposed group (breastfeeding for longer than 12 months)⁹.

The ratio of non-exposed to exposed subjects was 2:1, and statistical power of 90%. Considering a design effect of 1.6 and adding 30% for possible losses/ refusals, the minimum sample size was estimated at 395 children.

Data Collection

Data collection was performed throughout the year 2015. The team was composed of 5 examiners, all previously trained to apply the questionnaires, and calibrated for the clinical exams. Four trained and calibrated dentists performed the orthodontic measurements. The calibration phase was carried out in a laboratory on the premises of Federal University of Santa Maria. Theoretical classes and practical training were provided by a gold standard examiner in the area (M.M.), using different plaster models. Subsequently, the examiners were calibrated by examining 30 randomly selected children in one school. Children were re-evaluated twice by each dentist with a 15-day interval between exams. The inter and intra-examiner agreement values were higher than 0.70 for all orthodontic measures. A single speech-language therapist, considered gold standard in the area (L.C.B) performed all the speech-language assessments. To measure the intra examiner reproducibility, 30 children were evaluated at school and reassessed after one week. The Kappa value for this assessment exceeded 0.70 for all measures.

The exams were performed face-to-face, under natural light, with the patient's jaw in occlusion, in order to evaluate the three planes of interarch relationships, based on the Foster and Hamilton Index²⁵: a) transverse - unilateral or bilateral posterior crossbite (present/or absent); b) sagittal - changes in overjet (increased or diminished/anterior crossbite); and c) vertical - changes in overbite (deep or diminished/anterior open bite).

Posterior crossbite was recorded when at least one maxillary posterior tooth occluded in a palatal position to the buccal cusp of the opposing mandibular tooth. Overjet and overbite measurements were performed using a WHO probe (Millennium - Golgran, São Caetano do Sul, SP, Brazil), for measurements in millimeters^{13,25,26}. As regards overjet and overbite, measurements between 0.5 and 3.5 mm were considered adequate; accentuated, when equal to or over 4 mm, and diminished, when equal to or below 0 mm, showing evidence of anterior cross bite or anterior open bite²⁷.

Other clinical variables were: the presence of sleep disorder (0=absent and 1= present), respiratory mode (0=normal or 1=oral/oronasal) and position of the tongue (0= normal or 1= changed). Sleep disorder was evaluated through a questioner send to the parents. Respiratory mode and position of the tongue were evaluated by a single calibrated speech therapist using

an evaluation form composed of data extracted from the Orofacial Protocol with Scores (OMES)²⁸.

The behavioral variables were collected by means of a structured questionnaire, as has been done in previous studies^{22,29}. Data on the presence of non-nutritional feeding habits was collected, dichotomized into 0= absence or 1= presence of habit, and analyzed. Introduction of feeding bottle data was evaluated based on the period when the child began to use the feeding bottle, and was categorized into 0= did not use, 1= before the age of 6 months, and 2=after the age of 6 months. Breastfeeding data were evaluated based on the time in months, and with reference to the fact of having been exclusive. For analysis, the variable was categorized into 0= exclusive up to 6 months, 1= not exclusive; 2= did not breastfeed.

The demographic and socioeconomic variables were collected by means of a semi-structured questionnaire and included the following data: sex (female or male), skin color (white or non-white), mother's educational level. Age data were collected in years and categorized into thirds: 7-8, 9-10 and 11-13 years. Mothers' educational level data were collected in complete years of schooling, and afterwards dichotomized into incomplete (< 8 years) and complete (≥ 8 years) primary schooling.

Statistical Analysis

The data were analyzed by means of the STATA version 14.0 statistical software (*StataCorp. 2014. Stata Statistical Software: Release 14.0. College Station, TX: StataCorp LP*). Three outcomes were considered: (1) overjet (adequate/anterior cross bite/accentuated), (2) overbite (adequate/anterior open bite/deep) and posterior crossbite (present/absent). Descriptive analysis of the demographic, socioeconomic, behavioral and clinical characteristics of the sample was performed.

Binomial and Multinomial Logistic Regression Models were used to evaluate the association between the characteristics of the sample, according to the outcomes posterior cross bite, overjet and overbite, respectively. The predictive variables that showed a p-value of $p \leq 0.20$ in the non-adjusted analysis were included in the adjusted model. The results are presented as *odds ratio* (OR) and a respective confidence interval of 95% (CI 95%). The level of significance considered was 0.05. The analyses were first conducted considering the sample design in clusters. When testing the empty model, no context variability was observed in the outcomes ($p > 0.05$), therefore it was justifiable no to use multilevel analysis.

Results

In the final sample of 547 children, 500 were evaluated for overjet, 513 for overbite, and 538 in relation to PCB, due to the lack of some data for each specific outcome in some sample units. The mean age was 9.6 (SD 1.59) years. The majority of pupils were of the female sex (54.7%) and white skin color (79.2%). Relative to the socioeconomic level, the majority were children of mothers who had at least 8 years of formal education (67,3%). Considering the remaining characteristics, 57.8% were observed to have received exclusive breastfeeding up to 6 months of age, 37% had some form of sleep disturbance, and 77% had an oral or oronasal respiratory mode. Approximately 67.6% of the individual had at least some type of malocclusion, with deep overbite being the most prevalent type in the sample (46.6%) (Table I).

Table II shows the distribution of the characteristics of the sample with the different types of malocclusion evaluated. The presence of accentuated overjet and deep overbite were more frequent in pupils of the male sex. Children who were exclusively breastfed up to six months of age had higher frequency of normality for overjet and overbite, and the lowest PCB indexes. Children with changed posture of the tongue and those who had oral or oronasal respiratory modes had higher frequency of anterior open bite and posterior cross bite.

Adjusted and non-adjusted analysis among predictive variables with regard to overjet outcome, are presented in Table III. In the non-adjusted model, skin color, sex, respiratory mode and non-nutritive sucking habits were associated with the outcome ($p < 0.05$) (Table III). In the adjusted analysis, individuals of the non-white skin color were observed to have more chance of having ACB (OR 2.58; CI 95%, 1.03-6.48). Individuals of the male sex (OR 1.60; CI 95%, 1.09-2.47) and who had the oral/oronasal respiratory mode (OR 2;00; CI 95%,1.32-3.04) had more chance of having accentuated overjet (Table IV).

Table IV presents the non-adjusted and adjusted analyses among the predictive variables with regard to the presence of overbite. In the non-adjusted analysis, sex, age, non-nutritive sucking habits, respiratory mode and position of the tongue were associated with the outcome ($p < 0.05$) (Table V). After adjustment, Individuals who had non-nutritive sucking habits were observed to have 2.16 times more chance of having AOB (OR 2,16; CI 95%, 1.07-4.33). Whereas those who had an altered position of the tongue had 4.58 more chance of having AOB (OR; 4.58, CI 95%, 2.29-9.12). As regards deep overbite, it was observed that the older the age, the higher the probability of the child having deep overbite. Furthermore, it was observed that individuals with changed position of the tongue had less chance of having deep overbite (OR 0.29; CI 95%, 0.15-0.56).

The adjusted and non-adjusted Analyses among the predictive variables with regard to the outcome PCB are presented in Table V. In the non-adjusted analysis, the non-nutritive sucking habit and presence of change in the position of the tongue were associated with the presence of PCB ($p < 0.05$). After adjustment, only non-nutritive sucking habit maintained association, in which individuals who had the habit had 2.39 times more chance of having PCB (OR 2.39; CI 95%, 1.56-5.49).

Discussion

The aim of this study was to evaluate whether there was association between breastfeeding and non-nutritive sucking habits and the occurrence of different types of malocclusions in school children in the stage of mixed dentition. The findings partially confirmed the conceptual hypothesis because the presence of non-nutritive sucking habits was associated with a higher prevalence of AOB and PCB, but not with the presence of altered overjet. In addition, exclusive breastfeeding was not significantly associated with the occurrence of malocclusion in this stage of dentition. This finding was in agreement with that of Abreu et al (2015)²³, who conducted a systematic review and stated that there was no association between breastfeeding and the occurrence of malocclusion in mixed and permanent dentition. However, was in disagreement with Limeira et al (2013)²⁴, who conducted a cross-sectional study and found that the prevalence of posterior crossbite gradually decreased as the duration of exclusive breast-feeding increased.

The major portion of the children received exclusive breastfeed up to 6 months of age. The mothers' degree of enlightenment and socioeconomic level is believed to have contributed to this datum, possibly because the majority of the mothers had at least 8 years of formal education, in agreement with Heck et al. (2006), who found a positive association between maternal education and breastfeeding³⁰. In non-adjusted analysis, children who were exclusively breastfed up to six months of age had higher frequency of normality for overjet and overbite, and the lowest PCB indexes. However, when the variables were adjusted, this effect disappeared. We hypothesized that this happened because when deleterious habits were introduced, it was no longer possible to perceive the positive effect of breastfeeding on occlusion.

The presence of past non-nutritive sucking habits involved higher prevalence of AOB and PCB, in agreement with previous studies, which have found association between non-nutritive sucking habits and AOB^{9,29,31} and PCB^{9,29,32}. The literature has shown that the

presence of AOB was mainly associated with the use of a pacifier^{9,31}, whereas for PCB, thumb sucking was associated to a larger extent³¹.

The adjusted analysis showed that the changed position of the tongue was associated with AOB. Furthermore, children with the oronasal respiratory mode had a two times higher prevalence of overjet, in agreement with previous literature²⁹. For a long time, it has been known that there is a relationship between stomatognathic system anatomy – which includes the dental occlusion – and its physiology – represented by mastication, swallowing, speech and breathing³³. Therefore, when children are exposed to a non-nutritive sucking habit, this is capable of triggering a cascade of alterations in the system, depending on intensity, duration and frequency of the habit³⁴.

Non-white children had higher prevalence of ACB when compared with the white children. When the variable skin color was dichotomized, Asiatic and Black children were included in the non-white category. It is known that Africans have a high prevalence of negative overjet³⁵ and that Class III malocclusions are more prevalent among Asiatics^{26,35}, which could have been reflected in the expression of anterior cross bite.

Children of the male sex had higher prevalence of accentuated overbite. A previous study found higher prevalence of malocclusions in the male sex³⁶ and Class II is also more associated with this sex³⁷. Furthermore, children from 9 to 13 years of age have higher prevalence of deep overbite when compared with children from 7 to 8 years old. A previous study¹³ found similar results, pointing out that with the advance in age and increase in time of exposure to etiological factors, these may be predisposing factors for this malocclusion. Moreover, the changed position of the tongue appeared to be a factor of protection against deep overbite, since this increased the risk of AOB, as shown in the present study.

The finding showed the high prevalence of malocclusions in mixed dentition, as deep overbite was present in 46.6%, and increased overjet in 28% of the children with mixed dentition. Whereas a previous study found a prevalence of 30.6% of deep overbite and 26.9% of increased overjet²⁹.

As strong points of this study, the technique of sample selection and the use of a sample that was representative of the population are pointed out. The exclusion criteria applied led to significant loss of the initial sample invited to participate in the study, however, the minimum number suggested by the sample calculation was exceeded. Furthermore, the evaluations made in conjunction with professionals in the areas of Orthodontics and Orofacial Motricity are highlighted, considering that the human body, in its complexity, works with inter-relations of

different systems and that [in general] integral care and scientific studies lack attention from the different professional areas.

This study had limitations such as the use of a questionnaire sent to the families for data collection, with questions that referred to past issues such as breastfeeding, the introduction of the bottle feeding and non-nutritive sucking habits. The parents may possibly have been unable to provide accurate answers, causing a memory bias. Moreover, in a cross-sectional study, it is only possible to establish association between the predictors and the outcomes, but no causal relations could be determined. In this sense, it is suggested that longitudinal studies should be conducted.

Nevertheless, the recommendation of exclusive breastfeeding up to six months²⁰ to be continued up to two years of age³⁸ is unquestionable because of its nutritional and immunological benefits, and for the development of the stomatognathic system³⁸. However, the role of deleterious habits on the development of malocclusions in the mixed dentition stage was evident in this study, since growth and development are complex and multifactorial parts of the process. In this sense, it is important for public health managers to encourage good habits and behaviors related to oral health, by discouraging deleterious habits and encouraging exclusive breastfeeding. The repercussions of this approach could be improving outcomes in oral health, greater social well-being and quality of life in this group of the population.

Conclusions

Breastfeeding was not associated with the development of malocclusions, while past non-nutritive sucking habits were associated with the occurrence of malocclusion in mixed dentition.

Acknowledgment

Posthumous thanks to Prof. Ana Maria Toniolo da Silva for coordinating the umbrella project that gave rise to this manuscript, for her professional, personal teachings, and for dedicating a good part of her life to the topic of orofacial motricity and its interrelation with orthodontics.

REFERENCES

1. Ministério da Saúde (BR). Secretaria de Atenção à Saúde, Secretaria de Vigilância em Saúde. SB Brasil 2010: Pesquisa Nacional de Saúde Bucal: resultados principais. 2012. Available at: http://bvsms.saude.gov.br/bvs/publicacoes/pesquisa_nacional_saude_bucal.pdf. Accessed Sept 30 2020
2. Ghafari M, Bahadivand-Chegini S, Nadi T, Doosti-Irani A. The global prevalence of dental healthcare needs and unmet dental needs among adolescents: a systematic review and meta-analysis. *Epidemiol Health* 2019;41:e2019046. <https://doi.org/10.4178/epih.e2019046>.
3. Dimberg L, Arnrup K, Bondemark L. The impact of malocclusion on the quality of life among children and adolescents: a systematic review of quantitative studies. *Eur J Orthod* 2014;37(7):238-47. <https://doi.org/10.1093/ejo/cju046>.
4. Sischo L, Broder HL. Oral Health-related Quality of Life: What, Why, How, and Future Implications. *J Dent Res* 2011;90(11):1264-70. <https://doi.org/10.1177/0022034511399918>.
5. Botero-Mariaca P, Sierra-Alzate V, Rueda ZV, Gonzalez D. Lingual function in children with anterior open bite: A case-control study. *Int. Orthod.* 2018;16(4):733–43. <https://doi.org/10.1016/j.ortho.2018.09.009>.
6. Bueno SB, Bittar TO, Vazquez F de L, Meneghim MC, Pereira AC. Association of breastfeeding, pacifier use, breathing pattern and malocclusions in preschoolers. *Dental Press J Orthod* 2013;18(1):30–6. <https://doi.org/10.1590/S2176-94512013000100006>.
7. Peres KG, Chaffee BW, Feldens CA, Flores-Mir C, Moynihan P, Rugg-Gunn A. Breastfeeding and Oral Health: Evidence and Methodological Challenges. *J Dent Res* 2018;97(3):251–8. <https://doi.org/10.1177/0022034517738925>.
8. Kobayashi HM, Scavone H, Ferreira RI, Garib DG. Relationship between breastfeeding duration and prevalence of posterior crossbite in the deciduous dentition. *Am J Orthod Dentofac Orthop* 2010;137(1):54–8. <https://doi.org/10.1016/j.ajodo.2007.12.033>.
9. Sousa RV, Ribeiro GLA, Firmino RT, Martins CC, Granville-Garcia AF, Paiva SM. Prevalence and associated factors for the development of anterior open bite and posterior crossbite in the primary dentition. *Braz Dent J* 2014;25(4):336–42. <https://doi.org/10.1590/0103-6440201300003>.
10. Hermont AP, Martins CC, Zina LG, Auad SM, Paiva SM, Pordeus IA. Breastfeeding, bottle feeding practices and malocclusion in the primary dentition: A systematic review of cohort studies. *Int J Environ Res Public Health* 2015;12(3):3133–51. <https://doi.org/10.3390/ijerph120303133>.
11. Romero CC, Scavone H, Garib DG, Cotrim-Ferreira FA, Ferreira IR. Breastfeeding and non-nutritive sucking patterns related to the prevalence of anterior open bite in primary dentition. *J Appl Oral Sci* 2011;19(2):161–8. <https://doi.org/10.1590/S1678-77572011000200013>.
12. Rubin, MR. Facial Deformity a Preventable Disease. *Angle Orthod* 1979;49(2):98-103.

[https://doi.org/10.1043/0003-3219\(1979\)049<0098:FDAPD>2.0.CO;2](https://doi.org/10.1043/0003-3219(1979)049<0098:FDAPD>2.0.CO;2).

13. Chen X, Xia B, Ge L. Effects of breast-feeding duration, bottle-feeding duration and non-nutritive sucking habits on the occlusal characteristics of primary dentition. *BMC Pediatr* 2015;15(1):1–9. <https://doi.org/10.1186/s12887-015-0364-1>.
14. Moré EE, Calabuig NP, Vilariño ER, Pérez AP, Isern FS, Soler EM et al. Alteraciones del desarrollo dentofacial en los trastornos respiratorios del sueño infantil. *Acta Otorrinolaringol Esp* 2011;62(2):132–9. <https://doi.org/10.1016/j.otorri.2010.10.007>.
15. Castro LA, Modesto A, Vianna R, Soviero VLM. Cross-sectional study of the evolution of the primary dentition: shape of dental arches, overjet and overbite. *Pesqui Odontol Bras* 2002;16(4):367–73. <https://doi.org/10.1590/S1517-74912002000400015>.
16. Peres KG, Barros AJD, Peres MA, Victoria CG. Effects of breastfeeding and sucking habits on malocclusion in a birth cohort study. *Rev Saude Publica* 2007;41(3):343–50. <https://doi.org/10.1590/S0034-89102007000300004>.
17. Kragt L, Dharmo B, Wolvius EB, Ongkosuwito EM. The impact of malocclusions on oral health-related quality of life in children — a systematic review and meta-analysis. *Clin Oral Investig* 2016;20(8):1881–94. <https://doi.org/10.1007/s00784-015-1681-3>.
18. Tristão SKPC, Magno MB, Pintor AVB, Christovam IFO, Ferreira MTP, Maia LC et al. Is there a relationship between malocclusion and bullying? A systematic review. *Prog Orthod* 2020;21. <https://doi.org/10.1186/s40510-020-00323-7>.
19. Karjalainen S, Rönning O, Lapinleimu H, Simell O. Association between early weaning, non-nutritive sucking habits and occlusal anomalies in 3-year-old Finnish children. *Int J Paediatr Dent* 1999;9(3):169–73. <https://doi.org/10.1046/j.1365-263x.1999.00133.x>.
20. Peres KG, Cascaes AM, Peres MA, Demarco FF, Santos IN, Matijasevich, A, et al. Exclusive breastfeeding and risk of dental malocclusion. *J Pediatr* 2015;136(1):e60–7. <https://doi.org/10.1542/peds.2014-3276>.
21. Costa CT, Shqair AQ, Azevedo MS, Goettems ML, Bonow MLM, Romano AR. Pacifier use modifies the association between breastfeeding and malocclusion: a cross-sectional study. *Braz Oral Res* 2018;32:e101. <https://doi.org/10.1590/1807-3107bor-2018.vol32.0101>.
22. Corrêa-Faria P, Ramos-Jorge ML, Martins-Júnior PA, Vieira-Andrade RG, Marques LS. Malocclusion in preschool children: Prevalence and determinant factors. *Eur Arch Paediatr Dent* 2014;15(2):89–96. <https://doi.org/10.1007/s40368-013-0069-9>.
23. Abreu LG, Paiva SM, Pordeus IA, Martins CC. Breastfeeding, bottle feeding and risk of malocclusion in mixed and permanent dentitions: a systematic review. *Braz Oral Res* 2016;30(1):e22. <https://doi.org/10.1590/1807-3107BOR-2016.vol30.0022>.
24. Limeira AB, Aguiar CM, Bezerra NSL, Câmara AC. Association between Breast-feeding Duration and Posterior Crossbites. *J Dent Child* 2014;81(3):122-7 PMID: 25514255.
25. Foster TD, Hamilton MC. Occlusion in the primary dentition: study of children at 2 and

- one-half to 3 years of age. *Br Dent J* 1969;126(2):76-79.
26. Zere E, Chaudhari PK, Sharan J, Dhingra K, Tiwari N. Developing Class III malocclusions: challenges and solutions. *Clin Cosmet Investig Dent* 2018; 10 99–116. <https://doi.org/10.2147/CCIDE.S134303>.
27. Proffit WR, Fields HW, Sarver DM. *Contemporary Orthodontics*. 5th ed. Rio de Janeiro: Elsevier; 2012.
28. Felício CM, Ferreira CL. Protocol of orofacial myofunctional evaluation with scores. *Int J Pediatr Otorhinolaryngol* 2008;72(3):367-75.
29. Traebert E, Zanini FA, Nunes RD, Traebert J. Nutritional and non-nutritional habits and occurrence of malocclusions in the mixed dentition. *An Acad Bras Cienc* 2020;92(1). <https://doi.org/10.1590/0001-3765202020190833>.
30. Heck KE, Braveman P, Cubbin C, Chávez GF, Kiely J. Socioeconomic Status and Breastfeeding Initiation Among California Mothers. *Public Health Rep* 2006;121(1):51–9. <https://doi.org/10.1177/003335490612100111>
31. Germa A, Clément C, Weissenbach M, Heude B, Forhan A, Martin-Marchand L, et al. Early risk factors for posterior crossbite and anterior open bite in the primary dentition. *Angle Orthod* 2016;86(5):832–8. <https://doi.org/10.2319/102715-723.1>.
32. Nihi VSC, Maciel SM, Jarrus ME, Nihi FM, Salles CLF, Pascotto RC, et al. Pacifier-sucking habit duration and frequency on occlusal and myofunctional alterations in preschool children. *Braz Oral Res* 2015;29(1):1–7. <https://doi.org/10.1590/1807-3107BOR-2015.vol29.0013>.
33. Angle EH. *Treatment of malocclusion of the teeth: Angle's system*. 7th ed. Philadelphia: SS White Dental; 1907.
34. Graber TM. Thumb and finger-sucking. *Amer J Orthod* 1959;45(4):258-64.
35. Alhammadi MS, Halboub E, Fayed MS, Labib A, El-Saaidi C. Global distribution of malocclusion traits: A systematic review. *Dental Press J Orthod* 2018;23(6):e1–10. <https://doi.org/10.1590/2177-6709.23.6.40.e1-10>.
36. Brizon VSC, Cortellazzi KL, Vazquez FL, et al. Individual and contextual factors associated with malocclusion in Brazilian children. *Rev Saude Publica* 2014;47:118–28. <https://doi.org/10.1590/S0034-8910.2013047004426>.
37. Carvalho DM, Alves JB, Alves MH. Prevalence of malocclusion in schoolchildren with low socioeconomic status. *Rev Gaúch Odontol* 2011;59(1):71–7.
38. World Health Organization. Protecting, promoting and supporting breastfeeding in facilities providing maternity and newborn services. 2017. Available at: <https://apps.who.int/iris/bitstream/handle/10665/259386/9789241550086-eng.pdf;jsessionid=096CEC2F60B0E2D53F240A59FB4D01ED?sequence=1>. Accessed Oct 07 20.

Table I - Distribution of sample according to demographic, socioeconomic, behavioral and clinical characteristics (n=547)

Variables	n	%
<i>Demographic and Socioeconomic Variables</i>		
Sex		
Female	299	54.7
Male	248	45.3
Age		
7-8 years	156	28.6
9-10 years	207	38.0
11-13 years	182	33.4
Skin color		
White	433	79.2
Non white	114	20.8
Mothers' Educational level		
< 8 years	171	32.7
≥ 8 years	352	67.3
<i>Behavioral Variables</i>		
Breastfeeding		
Exclusive ≥ 6 months	316	57.8
Non-exclusive up to 6 months	169	30.9
Not breastfed	62	11.3
Non-nutritive Sucking Habits		
No	264	48.3
Yes	283	51.7
Introduction of feeding bottle		
Does not use	51	18.1
Before 6 months	180	64.1
After 6 months	50	17.8
<i>Clinical Characteristics</i>		
Sleep Disturbance		
Absent	344	63.0
Present	202	37.0
Respiratory mode		
Normal	126	23.0
Oral/Oronasal	421	77.0
Position of Tongue		
Normal	445	81.8
Altered	99	18.2
Overjet/overlap		
Adequate	339	67.8
ACB ^a	21	4.2
Accentuated	140	28.0
Overbite		
Adequate	222	43.3
AOB ^b	52	10.1
Deep	239	46.6
Posterior Crossbite		
Absent	478	88.9
Present	60	11.1

Values lower than 547 were due to absence of data

^aACB: anterior crossbite; ^bAOB; anterior open bite.

Table II: Distribution of sample characteristics according to presence of different types of malocclusions.

	Overjet [n (%)]			Overbite [n (%)]			PCB [n (%)]	
	Adequate	ACB	Accentuated	Adequate	AOB	Deep	Absent	Present
<i>Demographic and Socioeconomic Variables</i>								
Sex								
Female	201 (72.6)	11 (4.0)	65 (23.4)	136 (47.5)	32 (11.2)	118 (41.3)	256 (87.1)	38 (12.9)
Male	138 (61.9)	10 (4.5)	75 (33.6)	86 (37.9)	20 (8.8)	121 (53.3)	222 (90.9)	22 (9.1)
Age								
7-8 years	88 (69.8)	8 (6.4)	30 (23.8)	72 (54.1)	19 (14.3)	42 (31.6)	133 (87.5)	19 (12.5)
9-10 years	123 (63.7)	7 (3.6)	63 (32.6)	81 (40.9)	22 (11.1)	95 (48.0)	179 (88.2)	24 (11.8)
11-13 years	127 (70.9)	6 (3.4)	46 (25.7)	69 (38.3)	10 (5.6)	101 (56.1)	164 (90.6)	17 (9.4)
Skin color								
White	268 (67.9)	12 (3.0)	115 (29.1)	172 (42.4)	36 (8.9)	198 (48.7)	377 (88.5)	49 (11.5)
Non White	71 (67.6)	9 (8.6)	25 (23.8)	50 (46.7)	16 (15.0)	41 (38.3)	101 (90.2)	11 (9.8)
Mothers' Educational level								
< 8 years	102 (64.6)	9 (5.7)	47 (29.8)	64 (39.5)	19 (11.7)	79 (48.8)	150 (88.8)	19 (11.2)
≥ 8 years	217 (68.0)	12 (3.8)	90 (28.2)	151 (46.1)	30 (9.1)	147 (44.8)	306 (88.7)	39 (11.3)
<i>Behavioral Variables</i>								
Breastfeeding								
Exclusive > 6 months	201 (70.8)	11 (3.9)	72 (25.3)	132 (54.1)	29 (9.9)	132 (45.0)	277 (89.1)	34 (10.9)
Non-exclusive up to 6 months	103 (65.6)	8 (5.1)	46 (29.3)	66 (41.2)	13 (8.2)	81 (50.6)	145 (87.3)	21 (12.7)
Not breastfed	35 (59.3)	2 (3.4)	22 (37.3)	24 (40.0)	10 (16.7)	26 (43.3)	56 (91.8)	5 (8.2)
Non-nutritive Sucking Habits								
No	177 (71.7)	12 (4.9)	58 (23.4)	106 (42.1)	15 (5.9)	131 (52.0)	243 (93.8)	16 (6.2)
Yes	162 (64.0)	9 (3.6)	82 (32.4)	116 (44.4)	37 (14.2)	108 (41.4)	235 (84.2)	44 (15.8)
Introduction of feeding bottle								
Does not use	26 (54.2)	4 (8.3)	18 (37.5)	18 (36.7)	8 (16.3)	23 (47.0)	44 (89.8)	5 (10.2)
Before 6 months	113 (67.3)	6 (3.5)	49 (29.2)	71 (41.5)	14 (8.2)	86 (50.3)	157 (88.2)	21 (11.8)
After 6 months	31 (70.4)	2 (4.6)	11 (25.0)	24 (51.1)	9 (19.1)	14 (29.8)	38 (79.2)	10 (20.8)
<i>Clinical Characteristics</i>								
Sleep Disturbance								
Absent	74 (67.9)	4 (3.7)	31 (28.4)	52 (46.4)	7 (6.3)	53 (47.3)	112 (89.6)	13 (10.4)

Present	265 (67.8)	17 (4.4)	109 (27.9)	170 (42.4)	45 (11.2)	186 (46.4)	366 (88.6)	47 (11.4)
Respiratory mode								
Normal	235 (73.7)	11 (3.5)	73 (22.9)	135 (41.9)	23 (7.1)	164 (50.9)	307 (90.6)	32 (9.4)
Oral/Oronasal	103 (57.2)	10 (5.6)	67 (37.2)	86 (45.3)	29 (15.3)	75 (39.4)	170 (85.9)	28 (14.1)
Position of Tongue								
Normal	290 (69.2)	18 (4.3)	111 (26.5)	177 (41.9)	23 (5.5)	222 (52.6)	396 (90.6)	41 (9.4)
Altered	48 (61.5)	3 (3.9)	27 (34.6)	43 (48.9)	29 (33.0)	16 (18.1)	79 (80.6)	19 (19.4)

ACB: anterior crossbite; AOB: anterior open bite; PCB: posterior crossbite.

Table III: Adjusted and non-adjusted analysis among predictive variables with regard to overjet outcome, determined with the use of Multinomial Logistic Regression

Variables	ACB		Accentuated Overjet ^a	
	Non-adjusted OR ^b (CI ^c 95%)	Adjusted OR ^b (CI ^c 95%)	Non-adjusted OR ^b (CI ^c 95%)	Adjusted OR ^b (CI ^c 95%)
<i>Demographic and Socioeconomic Variables</i>				
Sex				
Female	1	1	1	1
Male	1.32 (0.54-3.20)	1.27 (0.52-3.11)	0.82 (0.49-1.36)	1.60 (1.09-2.47)*
Age				
7-8 years	1	-	1	-
9-10 years	0.62 (0.21-1.79)	-	1.50 (0.89-2.51)	-
11-13 years	0.51 (0.15-1.55)	-	1.06 (0.62-1.81)	-
Skin color				
White	1	1	1	1
Non white	2.83 (1.14-6.98)-	2.58 (1.03-6.48)*	0.82 (0.49-1.36)	0.74 (0.44-1.26)
Mothers' Educational level				
< 8 years	1	-	1	-
≥ 8 years	0.62 (0.25-1.53)	-	0.90 (0.58-1.37)	-
<i>Behavioral Variables</i>				
Breastfeeding				
Exclusive > 6 months	1	1	1	1
Non-exclusive	1.41 (0.55-3.63)	1.56 (0.58-4.15)	1.24 (0.80-1.93)	1.09 (0.68-1.74)
Not breastfed	1.04 (0.22-4.91)	1.10 (0.22-5.50)	1.75 (0.96-3.18)	1.43 (0.75-2.69)
Non-nutritive Sucking Habits				
No	1	1	1.54 (1.03-2.30)*	1
Yes	0.81 (0.33-1.99)	0.76 (0.30-1.95)	-	1.53 (0.93-2.19)
Introduction of feeding bottle				
Does not use	1	-	1	-
Before 6 months	0.34 (0.09-1.31)	-	0.62 (0.31-1.24)	-
After 6 months	0.41 (0.07-2.47)	-	0.51 (0.20-1.27)	-
<i>Clinical Characteristics</i>				
Sleep Disturbance				
Absent	1	-	1	-
Present	1.18 (0.38-3.63)	-	0.98 (0.61-1.57)	-
Respiratory mode				
Normal	1	1	1	1
Oral/Oronasal	2.07 (0.85-5.03)	1.80 (0.72-4.46)	2.09 (1.39-3.13)*	2.00 (1.32-3.04)*
Position of Tongue				
Normal	1	-	1	-
Altered	1.00 (0.28-3.54)	-	1.46 (0.87-2.47)	-

*P<0.05; ^aACB: anterior cross bite; ^bOR: odds ratio; ^cCI: confidence interval; Category of reference: adequate overjet

Table IV: Adjusted and non-adjusted analysis among predictive variables with regard to overbite outcome, determined with the use of Multinomial Logistic Regression

Variables	AOB ^a		Deep Overbite ^d	
	Non-adjusted OR ^b (CI ^c 95%)	Adjusted OR ^b (CI ^c 95%)	Non-adjusted OR ^b (CI ^c 95%)	Adjusted OR ^b (CI ^c 95%)
<i>Demographic and Socioeconomic Variables</i>				
Sex				0.011*
Female	1	-	1	
Male	0.93 (0.53-1.83)		1.62 (1.11-2.34)*	
Age				
7-8 years	1	1	1	1
9-10 years	1.02 (0.51-2.05)	0.95 (0.45-1.99)	2.01 (1.24-3.25)*	2.06 (1.26-3.38)*
11-13 years	0.54 (0.23-1.26)	0.46 (0.19-1.13)	2.50 (1.53-4.08)*	2.65 (1.61-4.38)*
Skin color				
White	1	1	1	1
Non white	1.52 (0.79-2.98)	1.68 (0.79-3.54)	0.71 (0.44-1.12)	0.64 (0.39-1.03)
Mothers' Educational level				
< 8 years	1	-	1	-
≥ 8 years	0.66 (0.35-1.27)		0.78 (0.52-1.17)	
<i>Behavioral Variables</i>				
Breastfeeding				
Exclusive > 6 months	1	-	1	-
Non-exclusive	0.89 (0.43-1.83)		1.22 (0.81-1.83)	
Not breastfed	1.89 (0.81-4.39)		1.08 (0.59-1.98)	
Non-nutritive Sucking Habits				
No	1	1	1	1
Yes	2.25 (1.17-4.34)*	2.16 (1.07-4.33)*	0.75 (0.52-1.08)	0.79 (0.54-1.16)
Introduction of feeding bottle				
Does not use	1	-	1	-
Before 6 months	0.44 (0.16-1.21)		0.94 (0.47-1.89)	
After 6 months	0.84 (0.27-2.61)		0.45 (0.18-1.12)	
<i>Clinical Characteristics</i>				
Sleep Disturbance				
Absent	1	-	1	-
Present	1.96 (0.83-4.62)		1.07 (0.69-1.65)	
Respiratory mode				
Normal	1	1	1	1
Oral/Oronasal	1.97 (1.07-3.64)*	1.26 (0.64-2.51)	0.71 (0.48-1.05)	0.75 (0.42-1.33)
Position of Tongue				
Normal	1	1	1	1
Altered	5.19 (2.73-9.85)*	4.58 (2.29-9.12)*	0.29 (0.16-0.54)*	0.29 (0.15-0.56)*

*P<0.05; ^aACB: anterior crossbite; ^bOR: odds ratio; ^cCI: confidence interval; ^dCategory of reference: adequate overbite

Table V - Adjusted and non-adjusted analysis among predictive variables with regard to posterior crossbite outcome, determined with the use of Multinomial Logistic Regression

Variables	Posterior Crossbite	
	Non-adjusted OR (CI 95%)	Adjusted OR (CI 95%)
<i>Demographic and Socioeconomic Variables</i>		
Sex		
Female	1	1
Male	0.66 (0.38-1.16)	0.68 (0.38-1.22)
Age		
7-8 years	1	-
9-10 years	0.93 (0.49-1.78)	-
11-13 years	0.72 (0.36-1.45)	-
Race		
White	1	-
Non white	0.83 (0.42-1.67)	-
Mothers' Educational level		
< 8 years	1	-
≥ 8 years	1.00 (0.56-1.80)	-
<i>Behavioral Variables</i>		
Breastfeeding		
EBF up to 6 months	1	1
Non-exclusive	1.17 (0.66-2.10)	0.84 (0.45-1.55)
Not breastfed	0.72 (0.27-1.94)	0.46 (0.17-1.28)
Non-nutritive Sucking Habits		
No	1	1
Yes	2.8 (1.56-5.17)	2.39 (1.56-5.49)*
Introduction of feeding bottle		
Does not use	1	-
Before 6 months	1.17 (0.41-3.30)	-
After 6 months	2.31 (0.72-7.37)	-
<i>Clinical Characteristics</i>		
Sleep Disturbance		
Absent	1	-
Present	1.10 (0.57-2.11)	-
Respiratory mode		
Normal	1	1
Oral/Oronasal	1.58 (0.92-2.71)	1.42 (0.79-2.53)
Position of Tongue		
Normal	1	1
Altered	2.32 (1.28-4.21)	1.86 (0.99-3.52)

*p<0.05; ^aOR: odds ratio, prevalence ratio ^bCI: confidence interval.

4 CONCLUSÕES

Foi possível observar a influência dos hábitos deletérios no desenvolvimento de más oclusões na dentição mista, pontuando:

A sucção não nutritiva apareceu como fator de risco para o desenvolvimento de mordida cruzada posterior;

A presença de sucção não nutritiva e a posição alterada da língua aumentam o risco de desenvolver mordida aberta anterior.

Crianças com modo respiratório oronasal apresentam maior risco no desenvolvimento de overjet acentuado;

A posição alterada da língua aparece associada a mordida aberta anterior.

REFERÊNCIAS

- ABREU, L. G. et al. Breastfeeding, bottle feeding and risk of malocclusion in mixed and permanent dentitions: a systematic review. **Brazilian Oral Research**. v. 30, n. 1, ed. 22. 2016.
- ALHAMMADI, M. S. et al. Global distribution of malocclusion traits: A systematic review. **Dental Press Journal of Orthodontics**. v. 23, n. 6, p. 1-10. 2018.
- ANGLE, E. H. **Treatment of malocclusion of the teeth: Angle's system**. 7 ed. Philadelphia: SS White Dental; 1907.
- BORONAT-CATALÁ, M. et al. Association between duration of breastfeeding and malocclusions in primary and mixed dentition: a systematic review and meta-analysis. **Scientific Reports**. v. 7, ed. 5048. 2017.
- BOTERO-MARIACA, P. et al. Lingual function in children with anterior open bite: A case-control study. **International Orthodontics**. v. 16, n. 4, p. 733-743. 2018.
- BRASIL. Ministério da Saúde. **SB Brasil 2010: Pesquisa Nacional de Saúde Bucal: resultados principais**. Brasília, DF. 2012. Disponível em: <http://bvsmms.saude.gov.br/bvs/publicacoes/pesquisa_nacional_saude_bucal.pdf>. Acesso em: 30 set 2020.
- BRIZON, V. S. C. et al. Individual and contextual factors associated with malocclusion in Brazilian children. **Revista de Saúde Pública**. v. 47, p. 118-128. 2014.
- BROOK, P. H.; SHAW, W. C. The development of an index of orthodontic treatment priority. **European Journal of Orthodontics**. v. 11, n. 3, p. 302-320, 1989.
- BUENO, S. B. et al. Association of breastfeeding, pacifier use, breathing pattern and malocclusions in preschoolers. **Dental Press Journal Orthodontics**. v. 18, n. 1, p. 30-36. 2013.
- CARVALHO, D. M.; ALVES, J. B.; ALVES, M. H. Prevalence of malocclusion in schoolchildren with low socioeconomic status. **Revista Gaúcha de Odontologia**. v. 59, n. 1, p. 71-77. 2011.
- CASTRO, L. A. et al. Cross-sectional study of the evolution of the primary dentition: shape of dental arches, overjet and overbite. **Pesquisa Odontológica Brasileira**. v. 16, n. 4, p. 367-373. 2002.
- CHEN, X.; XIA, B.; GE, L. Effects of breast-feeding duration, bottle-feeding duration and non-nutritive sucking habits on the occlusal characteristics of primary dentition. **BMC Pediatrics**. v. 15, n. 1, p. 1-9. 2015.
- CORRÊA-FARIA, P. et al. Malocclusion in preschool children: Prevalence and determinant factors. **European Archives of Paediatric Dentistry**. v. 15, n. 2, p. 89-96. 2014.

COSTA, C.T. et al. Pacifier use modifies the association between breastfeeding and malocclusion: a cross-sectional study. **Brazilian Oral Research**. v.32, ed. 101. 2018.

DIMBERG, L.; ARNRUP, K.; BONDEMARK, L. The impact of malocclusion on the quality of life among children and adolescents: a systematic review of quantitative studies. **European Journal of Orthodontics**. v. 37, n. 3, p.238-247. Jun. 2015.

FELÍCIO, C. M.; FERREIRA, C. L. Protocol of orofacial myofunctional evaluation with scores. **International Journal of Pediatric Otorhinolaryngology**.v. 72, n. 3, p.367-375. 2008.

FOSTER, T. D.; HAMILTON, M. C. Occlusion in the primary dentition: study of children at 2 and one-half to 3 years of age. **Brazilian Dental Journal**. v. 126, n. 1, p. 76-79. 1969.

FUJIKI, T. et al. Relationship between maxillofacial morphology and deglutitive tongue movement in patients with anterior open bite. **American Journal of Orthodontics and Dentofacial Orthopedics**. v. 125, n. 2, p. 160-167. 2004.

GERMA, A. et al. Early risk factors for posterior crossbite and anterior open bite in the primary dentition. **Angle Orthodontics**. v. 86, n. 5, p. 832–838. 2016.

GHAFARI, M.; BAHADIVAND-CHEGINI, S.; NADI, T. The global prevalence of dental healthcare needs and unmet dental needs among adolescents: a systematic review and meta-analysis. **Epidemiology and Health**. v. 41.2019.

GOMES, M. C. et al. Association between psychological factors, socio-demographic conditions, oral habits and anterior open bite in five-year-old children. **Acta Odontologica Scandinavica**. v.76, n.8, p. 553-558. 2018.

GRABER, T. M. Thumb and finger-sucking. **American Journal of Orthodontics and Dentofacial Orthopedics**. v. 45, n. 4, p. 258-264. 1959.

HECK, K. E. et al. Socioeconomic Status and Breastfeeding Initiation Among California Mothers. **Public Health Reports**. v. 121, n. 1, p. 51-59. 2006.

HERMONT, A. P. et al. Breastfeeding, bottle feeding practices and malocclusion in the primary dentition: A systematic review of cohort studies. **International Journal of Environmental Research and Public Health**. v. 12, n. 3, p. 3133–3151. 2015.

KARJALAINEN, S. et al. Association between early weaning, non-nutritive sucking habits and occlusal anomalies in 3-year-old Finnish children. **International Journal of Paediatric Dentistry**. v. 9, n. 3, p. 169-173. 1999.

KOBAYASHI, H. M. et al. Relationship between breastfeeding duration and prevalence of posterior crossbite in the deciduous dentition. **American Journal of Orthodontics and Dentofacial Orthopedics**. v. 137, n. 1, p. 54-58. 2010.

KRAGT, L. et al. The impact of malocclusions on oral health-related quality of life in

children — a systematic review and meta-analysis. **Clinical Oral Investigations**. v. 20, n. 8, p. 1881-1894. 2016.

LIMEIRA, A.B. et al. Association between Breast-feeding Duration and Posterior Crossbites. **Journal of Dentistry for Children**. v.81, n. 3, p.122-127. 2014.

LIN, L. H.; HUANG, G. W.; CHEN, C. S. Etiology and Treatment Modalities of Anterior Open Bite Malocclusion. **Journal of Experimental & Clinical Medicine**. v. 5, n. 1, p. 1-4. 2013.

MORÉ, E.E. et al. Alteraciones del desarrollo dentofacial en los trastornos respiratorios del sueño infantil. **Acta Otorrinolaringológica Española**.v. 62, n. 2, p. 132-139. 2011.

NEIVA, F.C.B. Desmame precoce: implicações para o desenvolvimento motor-oral. **Jornal de Pediatria (Rio de Janeiro)**. v. 79, n. 1, p. 7-12. 2003.

NIHI, V. S. C. et al. Pacifier-sucking habit duration and frequency on occlusal and myofunctional alterations in preschool children. **Brazilian Oral Research**. v. 29, n. 1, p. 1-7. 2015.

OCAMPO-PARRA, A. et al. Prevalence of dyslalias in 8 to 16 year-old students with anterior open bite in the municipality of Envigado, Colombia. **BMC Oral Health**. v. 15, n. 1, p. 1-6. 2015.

PAOLANTONIO, E. G. et al. Association between oral habits, mouth breathing and malocclusion in Italian preschoolers. **European Journal of Paediatric Dentistry**. v. 20, n. 3, p. 204-208. 2019.

PERES, K.G. et al. Effects of breastfeeding and sucking habits on malocclusion in a birth cohort study. **Revista de Saúde Pública**. v. 41, n. 3, p. 343-350. 2007.

PERES, K. G. et al. Exclusive breastfeeding and risk of dental malocclusion. **Jornal de Pediatria (Rio de Janeiro)**. v.136, n. 1, p.60-67. 2015.

PERES, K. G,et al. Breastfeeding and Oral Health: Evidence and Methodological Challenges. **Journal of Dental Research**. v. 97, n. 3, p. 251-258. 2018.

PROFFIT, W. R.; FIELDS, H. W.; SARVER, D. M. **Contemporary Orthodontics**. 5 ed. Rio de Janeiro: Elsevier; 2012.

ROMERO, C. C. et al. Breastfeeding and non-nutritive sucking patterns related to the prevalence of anterior open bite in primary dentition. **Journal of Applied Oral Science**. v. 19, n. 2, pg. 161-168. 2011.

RUBIN, M. R. Facial Deformity a Preventable Disease. **Angle Orthodontist**. v. 49, n. 2, p. 98-103. 1979.

SILVA, A. A. L. et al. Maternal breastfeeding: indicators and factors associated with exclusive breastfeeding in a subnormal urban cluster assisted by the Family Health Strategy. **Jornal de Pediatria (Rio de Janeiro)**. v. 95, n. 3, p. 298-305. 2019.

SISCHO, L.; BRODER, H. L. Oral Health-related Quality of Life. What, Why, How, and Future Implications. **Journal of Dental Research**.v. 90, n. 11, p. 1264-1270. 2011.

SOUSA, R. V. Prevalence and associated factors for the development of anterior open bite and posterior crossbite in the primary dentition. **Brazilian Dental Journal**. v. 25, n. 4, p. 336-342. 2014.

THOMAZ, E. B. A. F. et al., Maternal breastfeeding, parafunctional oral habits and malocclusion in adolescents: A multivariate analysis **International Journal of Pediatric Otorhinolaryngology**. v. 76, p. 500-506. 2012.

TRAEBERT, E. et al. Nutritional and non-nutritional habits and occurrence of malocclusions in the mixed dentition. **Anais da Academia Brasileira de Ciências**. v. 92, n. 1. 2020.

TRISTÃO, S. K. P. C. et al. Is there a relationship between malocclusion and bullying? A systematic review. **Progress in Orthodontics**. v.21. 2020

VOLK, J. et al. Three-dimensional ultrasound diagnostics of tongue posture in children with unilateral posterior crossbite. **American Journal of Orthodontics and Dentofacial Orthopedics**. v. 138, n. 5, p. 608-612. 2010.

WORLD HEALTH ORGANIZATION. **Protecting, promoting and supporting breastfeeding in facilities providing maternity and newborn services**. Geneva, Suíça. 2017. Disponível em:
<<https://apps.who.int/iris/bitstream/handle/10665/259386/9789241550086-eng.pdf;jsessionid=096CEC2F60B0E2D53F240A59FB4D01ED?sequence=1>>. Acesso em: 07 set 2020.

ZERE, E. et al. Developing Class III malocclusions: challenges and solutions. **Clinical, Cosmetic and Investigational Dentistry**. v.10, p. 99-116. 2018.

ZHAO, J. et al. Maternal education and breastfeeding practices in China: A systematic review and meta-analysis. **Midwifery**. v.50, p. 62-71. 2017.

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Please ensure that the words 'this issue' are added to any references in the list (and any citations in the text) to other articles in the same Special Issue.

Reference management software

Most Elsevier journals have their reference template available in many of the most popular reference management software products. These include all products that support Citation Style Language styles, such as Mendeley. Using citation plug-ins from these products, authors only need to select the appropriate journal template when preparing their article, after which citations and bibliographies will be automatically formatted in the journal's style. If no template is yet available for this journal, please follow the format of the sample references and citations as shown in this Guide. If you use reference management software, please ensure that you remove all field codes before submitting the electronic manuscript. More information on how to remove field codes from different reference management software.

Users of Mendeley Desktop can easily install the reference style for this journal by clicking the following link:

<http://open.mendeley.com/use-citation-style/american-journal-of-orthodontics-and-dentofacial-orthopedics>

When preparing your manuscript, you will then be able to select this style using the Mendeley plug-ins for Microsoft Word or LibreOffice.

Reference style

Text: Indicate references by superscript numbers in the text. The actual authors can be referred to, but the reference number(s) must always be given.

List: Number the references in the list in the order in which they appear in the text.

Examples:

Reference to a journal publication:

1. Van der Geer J, Hanraads JAJ, Lupton RA. The art of writing a scientific article. *Sci Commun* 2010;16351-9.

Reference to a book:

2. Strunk Jr W, White EB. *The elements of style*. 4th ed. New York: Longman; 2000.

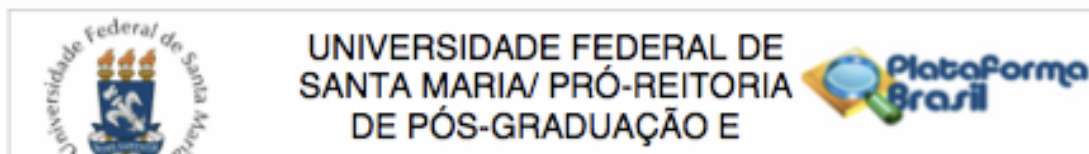
Reference to a chapter in an edited book:

3. Mettam GR, Adams LB. How to prepare an electronic version of your article. In: Jones BS, Smith RZ, editors. *Introduction to the electronic age*. New York: E-Publishing Inc; 2009. p. 281-304.

Note shortened form for last page number. e.g., 51-9, and that for more than 6 authors the first

6 should be listed followed by 'et al.' For further details you are referred to 'Uniform Requirements for Manuscripts submitted to Biomedical Journals' (J Am Med Assoc 1997;**277**:927–34) (see also http://www.nlm.nih.gov/bsd/uniform_requirements.html).

ANEXO 2 - Parecer consubstanciado do Comitê de Ética.



PARECER CONSUBSTANCIADO DO CEP

DADOS DO PROJETO DE PESQUISA

Título da Pesquisa: CARACTERIZAÇÃO E AVALIAÇÃO INTEGRADAS DOS DISTÚRBIOS DA MOTRICIDADE OROFACIAL E DA POSTURA CORPORAL - FASE 2

Pesquisador: ANA MARIA TONIOLO DA SILVA

Área Temática:

Versão: 4

CAAE: 08105512.0.0000.5346

Instituição Proponente: Universidade Federal de Santa Maria/ Pró-Reitoria de Pós-Graduação e

Patrocinador Principal: Financiamento Próprio

DADOS DO PARECER

Número do Parecer: 937.461

Data da Relatoria: 10/03/2015

Apresentação do Projeto:

O proponente apresenta emenda ao projeto intitulado "Caracterização e avaliação integradas dos distúrbios da motricidade orofacial e da postura corporal - fase 2a".

A justificativa para a emenda é a que segue: "A emissão deste documento foi necessária tendo em vista a inclusão de um pequeno aspecto metodológico nas avaliações já previstas e a atualização do grupo de participantes, pois alguns deixaram de participar do projeto e outros necessitam ser incluídos. O Termo de Consentimento Livre e Esclarecido precisou ser atualizado, a fim de contemplar o aspecto metodológico incluído."

Pelo que foi apresentado, entende-se que a emenda pode ser aprovada.

Objetivo da Pesquisa:

.

Avaliação dos Riscos e Benefícios:

.

Endereço: Av. Roraima, 1000 - prédio da Reitoria - 2º andar

Bairro: Camobi

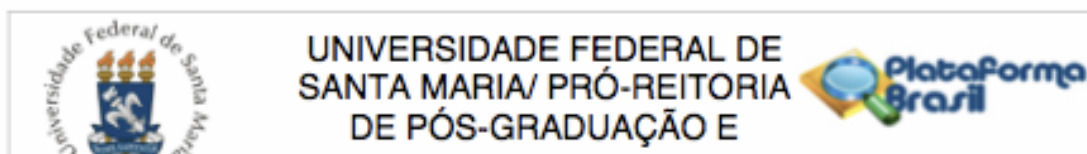
CEP: 97.105-970

UF: RS

Município: SANTA MARIA

Telefone: (55)3220-9362

E-mail: cep.ufsm@gmail.com



Continuação do Parecer: 837.461

Comentários e Considerações sobre a Pesquisa:

.

Considerações sobre os Termos de apresentação obrigatória:

Foram apresentados de modo suficiente.

Recomendações:

Veja no site do CEP - <http://w3.ufsm.br/nucleodecomites/index.php/cep> - na aba "orientações gerais", modelos e orientações para apresentação dos documentos. Acompanhe as orientações disponíveis, evite pendências e agilize a tramitação do seu projeto.

Conclusões ou Pendências e Lista de Inadequações:

.

Situação do Parecer:

Aprovado

Necessita Apreciação da CONEP:

Não

Considerações Finais a critério do CEP:

SANTA MARIA, 23 de Janeiro de 2015

Assinado por:
CLAUDEMIR DE QUADROS
(Coordenador)

Endereço: Av. Roraima, 1000 - prédio da Reitoria - 2º andar
Bairro: Camobi **CEP:** 97.105-970
UF: RS **Município:** SANTA MARIA
Telefone: (55)3220-9362 **E-mail:** cep.ufsm@gmail.com

APÊNDICE 1 – QUESTIONÁRIO ENVIADO AOS PAIS

Agradecemos por estar participando da nossa pesquisa! As avaliações fonoaudiológicas e odontológicas dos alunos na Escola já iniciaram. Agora estamos enviando um novo questionário para ser preenchido e contamos com sua colaboração. Algumas questões se repetem, pois alguns pais esqueceram de responder as mesmas no questionário anterior. Qualquer dúvida, entre em contato conosco: 55 9949 1938 (Vivo) – Luana.

- 1) Nome da criança: _____
- 2) Telefone: _____
- 3) Turma: _____
- 4) Você considera seu filho(a) da raça: () branca () negra () mulato () outro (oriental, índio)
- 5) No mês passado, quanto receberam em Reais, juntas, todas as pessoas que moram na sua casa? (incluindo salários, bolsa família, pensão, aposentadoria e outros rendimentos)_____
- 6) Quantos cômodos tem a casa (exceto/menos banheiro)? _____
- 7) Quantas pessoas, incluindo o Sr(a), moram na casa? _____
- 8) O pai trabalha? () sim () não
- 9) A mãe trabalha? () sim () não
- 10) A mãe estudou até: () não estudou; () 1º grau incompleto; () 1º grau completo; () 2º grau incompleto; () 2º grau completo; () 3º grau incompleto; () 3º grau completo
- 11) O pai estudou até: () não estudou; () 1º grau incompleto; () 1º grau completo; () 2º grau incompleto; () 2º grau completo; () 3º grau incompleto; () 3º grau completo
- 12) Seu filho (a) usou MAMADEIRA? () Sim, iniciou com que idade? _____ parou com que idade? _____ () Não () ainda usa
- 13) Seu filho (a) usou CHUPETA? () Sim, iniciou com que idade? _____ parou com que idade? _____ () Não () ainda usa
- 13) Seu filho (a) CHUPOU DEDO? () Sim, iniciou com que idade? _____ parou com que idade? _____ () Não () ainda chupa

14) Seu filho (a) MAMOU NO PEITO (SEIO MATERNO)? () Sim, iniciou com que idade?
_____ parou com que idade? _____ () Não () ainda mama

15) Seu filho (a) RONCA quando está dormindo? () Sim, sempre (todas as noites ou quase todas as noites) () Não () Sim, às vezes.

16) Seu filho BABA NO TRAVESSEIRO? () Sim, sempre (todas as noites ou quase todas as noites)

() Não () Sim, às vezes.

17) Seu filho fica com a BOCA ABERTA AO LONGO DO DIA? () Sim, sempre que eu olho pra ele

() Não () Sim, às vezes, na metade das vezes que eu vejo

18) Seu filho fica com BOCA ABERTA ENQUANTO DORME? () Sim, sempre () Não () Sim, às vezes, somente quando está com o nariz “trancado”

19) Seu filho tem o hábito de RANGER OS DENTES quando está dormindo? () Sim, sempre (todas as noites ou quase todas as noites) () Não () Sim, às vezes

20) Seu filho(a) procurou o dentista nos últimos 6 meses? () Sim () Não

21) Quando foi a última visita ao dentista? () até 3 meses () 3 a 6 meses

() 6 meses a 1 ano () mais que 1 ano () nunca visitou

22) Motivo da última consulta:

() dor de dente

() dor na boca

() batidas e quedas

() exame e rotina

() outros: _____

23) Tipo de serviço que você levou seu filho(a) na última consulta:

() dentista particular

() dentista público (posto de saúde, faculdade, escola)

24) Você diria que a saúde dos dentes, lábios, maxilares e boca do seu filho(a) é:

() Excelente () Muito boa () Boa () Regular () Ruim

25) Comparando com as outras crianças que seu filho(a) convive, você diria que a saúde dos dentes, lábios, maxilares e boca do seu filho(a) é:

Melhor que a deles Pior que a deles Igual a deles

26) O senhor(a) visitou algum amigo (ou vizinho) ou algum amigo seu (ou vizinho) visitou o senhor(a) nos últimos 12 meses?

Não Sim, menos de uma vez por mês Sim, pelo menos uma vez por mês Sim, mais de uma vez por mês pelo menos

APÊNDICE 2 - PROTOCOLO DE AVALIAÇÃO MIOFUNCIONAL

Ficha de Avaliação Miofuncional

Nome: _____
Data: ____/____/____ Idade: _____ Escola: _____ Turma: _____

APARÊNCIA E CONDIÇÃO POSTURAL/POSIÇÃO

Condição Postural dos Lábios		Escores
Oclusão normal dos lábios	Normal	(3)
Oclusão dos lábios com tensão	Atividade aumentada dos lábios e Mm. Mental	(2)
Ausência de oclusão labial	Disfunção leve (entreabertos)	(2)
	Disfunção severa (totalmente abertos)	(1)
Postura vertical da mandíbula		
Postural normal	Mantém espaço funcional livre	(3)
Oclusão dos dentes	Sem espaço funcional livre	(2)
Boca aberta	Disfunção leve	(2)
Excessiva abertura de boca	Disfunção severa	(1)
Aparência de bochechas		
Normal		(3)
Volume aumentado ou flácida/arqueadas	Leve	(2)
	Severa	(1)
Aparência da face		
Simetria entre os lados D/E	Normal	(3)
Assimetria Lado aumentado: () D () E	Leve	(2)
	Severa	(1)
Posição da língua		
Contida na cavidade oral	Normal	(3)
Interposta aos arcos dentários	Adaptação ou disfunção	(2)
	Protruída em excesso	(1)
Aparência do palato duro		
Largura adequada	Normal	(3)
Largura diminuída (estrito)	Leve	(2)
	Severo	(1)
Profundidade palato duro (MBGR): () adequada () reduzida (baixo) () aumentada (alto)		
Largura do palato duro (MBGR): () adequada () aumentada (larga) () reduzida (estreita)		

MOBILIDADE

DESEMPENHO	MOVIMENTOS LABIAIS				Escores
	Protrusão	Retração	Lateralidade D	Lateralidade E	
Preciso	(3)	(3)	(3)	(3)	
Falta de precisão/tremor	(2)	(2)	(2)	(2)	
Inabilidade Severa	(1)	(1)	(1)	(1)	
Somatória máxima=12					Somatória:
Estalar protruídos	() Preciso	() Falta de precisão/tremor	() Inabilidade Severa		
Estalar Retraídos	() Preciso	() Falta de precisão/tremor	() Inabilidade Severa		

DESEMPENHO	MOVIMENTOS DA LINGUA						Escores
	Protruir	Retrair	Lateral D	Lateral E	Elevar	Abaixar	
Preciso	(3)	(3)	(3)	(3)	(3)	(3)	
Falta de precisão/tremor	(2)	(2)	(2)	(2)	(2)	(2)	
Inabilidade Severa	(1)	(1)	(1)	(1)	(1)	(1)	
Somatória Máxima=18						Somatória:	
Estalar o ápice	()Preciso		()Falta de precisão/tremor		() Inabilidade Severa		
Sugar língua no palato	()Preciso		()Falta de precisão/tremor		() Inabilidade Severa		
Vibrar	()Preciso		()Falta de precisão/tremor		() Inabilidade Severa		

DESEMPENHO	MOVIMENTOS DE MANDÍBULA					Escores
	Abaixar	Elevar	Lateral D	Lateral E	Protruir	
Preciso	(3)	(3)	(3)	(3)	(3)	
Falta de precisão/desvio	(2)	(2)	(2)	(2)	(2)	
Inabilidade Severa	(1)	(1)	(1)	(1)	(1)	
Somatória Máxima=15					Somatória:	

DESEMPENHO	MOVIMENTOS DE BOCHECHAS				Escores
	Inflar	Sugar	Retrair	Lateralizar o ar	
Preciso	(3)	(3)	(3)	(3)	
Falta de precisão/tremor	(2)	(2)	(2)	(2)	
Inabilidade Severa	(1)	(1)	(1)	(1)	
Somatória Máxima=12				Somatória:	

FUNÇÕES

Respiração		Escore
Respiração nasal	Normal	(3)
Respiração oronasal	Leve (ON)	(2)
	Severa (O)	(1)
Possibilidade de uso nasal: () 2 min ou mais () entre 1 e 2 min () menos que 1 min		

Fala: automática – contagem de 1 a 20, dias da semana, meses do ano, alfabeto (MBGR)				
Omissão	() ausente	() assistemática	() sistemática	Fone(s):
Substituição	() ausente	() assistemática	() sistemática	Fone(s):
Distorção	() ausente	() assistemática	() sistemática	Fone(s):

Em caso de distorção: [] interdental anterior [] interdental lateral [] ausência ou pouca vibração do ápice [] vibração múltipla do ápice [] elevação do dorso [] rebaixamento do dorso [] outras:

Fala: Nomeação de figuras da prancha (MBGR)				
Omissão	() ausente	() assistemática	() sistemática	Fone(s):
Substituição	() ausente	() assistemática	() sistemática	Fone(s):
Distorção	() ausente	() assistemática	() sistemática	Fone(s):

Em caso de distorção: [] interdental anterior [] interdental lateral [] ausência ou pouca vibração do ápice [] vibração múltipla do ápice [] elevação do dorso [] rebaixamento do dorso [] outras:

